





Catalog containing valuable  
information in connection  
with the use

*of*

CLAY FIRE BRICK

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ALABAMA

CLAY PRODUCTS

COMPANY

833-37 MARTIN BLDG

BIRMINGHAM, ALA.

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ISSUED FEBRUARY, 1926

*under the direction of the*

AMERICAN REFRACTORIES  
INSTITUTE

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WITH REVISIONS TO DATE

## FOREWORD

### To the Purchaser of Fire Brick :

While the prime purpose of fire brick or refractory materials is for protection against extreme heats, yet this is not the only requirement, and in many cases the fusion point (that degree of heat necessary to melt the brick) should not be the first or only consideration.

It is, of course, absolutely essential that the heat resistive qualities be sufficient, with a good margin to spare, for protection against vitrification or softening of the brick ; but in a great many instances the fluxing elements, slag action, spalling and abrasion are, by far, much more detrimental to the life of good refractory brick than is the actual heat.

For long life and satisfactory service, therefore, a fire brick must have the ability to withstand high heat variations, and must also be adapted to resist erosion and abrasion. It must be free from spalling and from contraction or expansion. It must be of uniform size and uniform structure.

The success with which EXCELSIOR FIRE BRICK have fully met the requirements of all kinds of industrial trade is due to the careful selection of the raw materials, the nature and high qualities of the fire clays, together with the process of manufacture.

With the proper grinding, tempering, molding and burning, and with the exact mixtures of our raw clays, we are able to produce a fire brick suitable for practically all purposes.

By using different proportions of the four raw clays, and with the proper mixture of calcined or grog, it is possible to manufacture a fire brick of any desired character or structure. They may be open or of extreme porous texture, of medium or high refractoriness, dense or of varying strength—the physical structure of the brick depending upon the purpose for which it is to be used.

Excelsior Fire Brick are dense and tough enough, yet of sufficient porosity to have gained and held for thirty years an enviable record for long life under severe conditions.

Excelsior Fire Brick are especially adapted for installations where heavy load pressure and much slag and abrasive action shorten the life of some other fire brick.

The natural bond enabling this brick to resist the wear and tear action of clinker, moving fuel, slag and iron and the many gases. These are the things most detrimental to the life of fire brick. Spalling is another very serious consideration which has been overcome in Excelsior Fire brick by the elimination of lamination or folds in the clays and by exact mixtures of the raw clays.

We recommend Excelsior Fire Brick for iron and foundry trade, for cupolas, stack and flue lining, furnaces, stokers, power plants and boiler settings of all kinds, for saw mills, lime and brick kilns, coke ovens, etc.

Actual proof of the staying quality or service performance of Excelsior Fire Brick is furnished by our steadily increasing trade with these and all similar industries.

BIRMINGHAM, ALA.

Excelsior Fire Brick are manufactured by both the "stiff mud" and hand made processes.

All special shapes are hand molded, by experts in this line, from high grade, hand picked fire clays, being especially made to resist high heat temperatures, slag action and abrasion.

Excelsior Fire Brick are good fire brick.

**FOR QUICK REPAIR JOBS**

"Excelsior" service is at your disposal. Wire or phone your requirements if your need is urgent.



## GUARANTEES

No performance guarantee of any kind is made in the sale of refractories.

In the execution of orders for our products we undertake to furnish material which in our judgment is best suited for the purpose for which it is purchased.

Having thus met the full sense of the obligation to the industries we serve and having no control over the use of our product after same is placed in service, we feel that there is a similar obligation on the part of the purchaser to seek and select the material which will give him the best results and to exercise extreme care and discretion in the use of the material which he receives.

## DEVIATIONS

Variations (plus or minus) of 2% from specified dimensions, covering both shrinkage and warpage, on dimensions of 4" or over.

On dimensions under 4", the allowed variations covering shrinkage and warpage will be 3%.



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STANDARDIZED  
CLAY FIRE BRICK  
SHAPES

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# STANDARD 9" SHAPES IN



9" STRAIGHT  
9" x 4½" x 2½"



SMALL 9" BRICK  
9" x 3½" x 2½"



SOAP  
9" x 2½" x 2¼"



CHECKER  
9" x 2¾" x 2¾"



SPLIT BRICK  
9" x 4½" x 1¼"

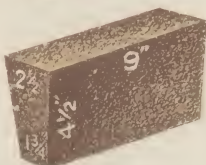


2" BRICK  
9" x 4½" x 2"

## FIRE CLAY MATERIAL



**NO. 1 ARCH**  
9" x 4 1/2" x (2 1/2" — 2 1/8")



**NO. 2 ARCH**  
9" x 4 1/2" x (2 1/2" — 1 3/4")



**NO. 3 ARCH**  
9" x 4 1/2" x (2 1/2" — 1")



**NO. 1 WEDGE**  
9" x 4 1/2" x (2 1/2" — 1 7/8")



**NO. 2 WEDGE**  
9" x 4 1/2" x (2 1/2" — 1 1/2")



**NO. 3 WEDGE**  
9" x 4 1/2" x (3" — 2")

## STANDARD 9" SHAPES IN



**NO. 1 KEY**  
 $9'' \times (4\frac{1}{2}'' - 4'') \times 2\frac{1}{2}''$



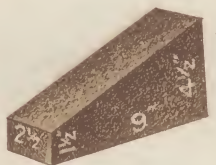
**NO. 2 KEY**  
 $9'' \times (4\frac{1}{2}'' - 3\frac{1}{2}'') \times 2\frac{1}{2}''$



**NO. 3 KEY**  
 $9'' \times (4\frac{1}{2}'' - 3'') \times 2\frac{1}{2}''$



**NO. 4 KEY**  
 $9'' \times (4\frac{1}{2}'' - 2\frac{1}{4}'') \times 2\frac{1}{2}''$



**EDGE SKEW**  
 $9'' \times (4\frac{1}{2}'' - 1\frac{1}{2}'') \times 2\frac{1}{2}''$



**FEATHER EDGE**  
 $9'' \times 4\frac{1}{2}'' \times (2\frac{1}{2}'' - \frac{1}{8}'')$

# FIRE CLAY MATERIAL



**NO. 1 NECK**  
 $9'' \times 4\frac{1}{2}'' \times 3\frac{1}{2}'' \times 2\frac{1}{2}'' \times \frac{5}{8}''$



**NO. 2 NECK**  
 $9'' \times 4\frac{1}{2}'' \times 2\frac{1}{2}'' \times 1\frac{1}{2}'' \times \frac{5}{8}''$



**NO. 3 NECK**  
 $9'' \times 4\frac{1}{2}'' \times (2\frac{1}{2}'' - \frac{5}{8}'')$



**END SKEW**  
 $(9'' - 6\frac{3}{4}'') \times 4\frac{1}{2}'' \times 2\frac{1}{2}''$



**SIDE SKEW**  
 $9'' \times (4\frac{1}{2}'' - 2\frac{1}{4}'') \times 2\frac{1}{2}''$



**JAMB BRICK**  
 $9'' \times 4\frac{1}{2}'' \times 2\frac{1}{2}''$

## STANDARD 9" SERIES



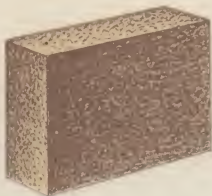
**BUNG ARCH**  
 $9'' \times 4\frac{1}{2}'' \times (2\frac{1}{2}'' - 2\frac{3}{8}'')$



**CIRCLE BRICK**

Name	Diameter		No. of Brick to a Circle
	Inside	Outside	
24" Circle	24"	33"	12
36" "	36"	45"	16
48" "	48"	57"	20
60" "	60"	69"	24
72" "	72"	81"	28
84" "	84"	93"	32

## STANDARD SHAPES



LARGE 9"  
9" x 6 $\frac{3}{4}$ " x 2 $\frac{1}{2}$ "



LARGE 9" NO. 1 WEDGE  
9" x 6 $\frac{3}{4}$ " x (2 $\frac{1}{2}$ " - 1 $\frac{7}{8}$ ")



LARGE 9" NO. 2 WEDGE  
9" x 6 $\frac{3}{4}$ " x (2 $\frac{1}{2}$ " - 1 $\frac{1}{2}$ ")



FLAT BACK STRAIGHT  
9" x 6" x 2 $\frac{1}{2}$ "



NO. 1 FLAT BACK ARCH  
9" x 6" x (3 $\frac{1}{2}$ " - 2 $\frac{1}{2}$ ")

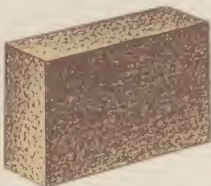
NO. 2 FLAT BACK ARCH  
9" x 6" x (3 $\frac{1}{2}$ " - 2")



## STANDARD SHAPES IN



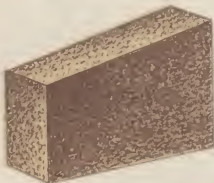
9" x 4½" x 3" STRAIGHT



9" x 6" x 2½" STRAIGHT  
ALSO 9" x 6" x 3"



9" x 6" No. 1 KEY  
9" x (6" - 5⅞") x 2½"  
ALSO 9" x (6" - 5⅞") x 3"

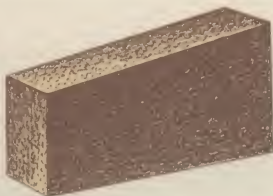


9" x 6" No. 2 KEY  
9" x (6" - 4⅜") x 2½"  
ALSO 9" x (6" - 4⅜") x 3"

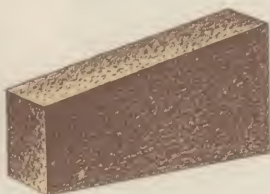


13½" STRAIGHT  
13½" x 6" x 2½"  
ALSO 13½" x 6" x 3"

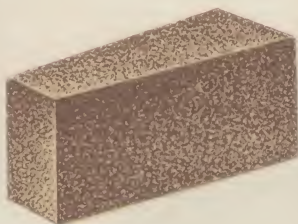
## FIRE CLAY MATERIAL



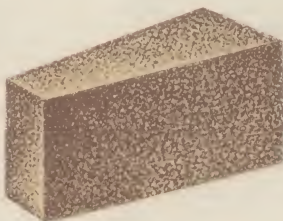
13½" No. 1 KEY  
 13½" x (6" - 5") x 2½"  
 ALSO 13½" x (6" - 5") x 3"



13½" No. 2 KEY  
 13½" x (6" - 4¾") x 2½"  
 ALSO 13½" x (6" - 4¾") x 3"



13½" No. 1 WEDGE  
 13½" x 6" x (3" - 2¾")



13½" No. 2 WEDGE  
 13½" x 6" x (3" - 2½")

13½" No. 3 WEDGE  
 13½" x 6" x (3" - 2")

## STANDARD SHAPES IN

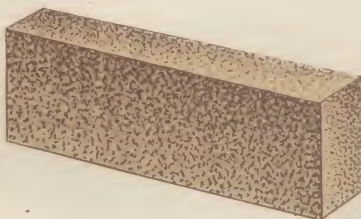


STOCK HOLE TILE  
18" x 9" x 4½"



SQUARE EDGE TILE  
12" x 12" x 3"

## FIRE CLAY MATERIAL



### REGENERATOR TILE

18" x 6" x 3"

18" x 9" x 3"	22½" x 12" x 4"
18" x 9" x 4"	27" x 9" x 3"
18" x 12" x 4"	27" x 9" x 4"
22½" x 6" x 3"	27" x 12" x 4"
22½" x 9" x 3"	31½" x 12" x 4"
22½" x 9" x 4"	36" x 12" x 4"



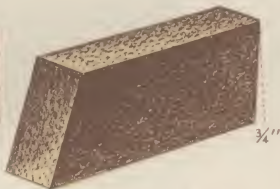
### BRIDGE BLOCK

13½" x 6" x 3"

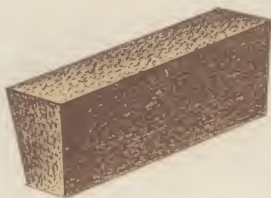
## STANDARD SHAPES IN



No. 101 SQUARE BUNG  
13" x 4½" x 3"



No. 102 ANGLE BUNG  
(11⅜" — 12¾") x 4½" x 3"



No. 103 ARCH BUNG  
13" x 4½" x (3" — 2⅝")

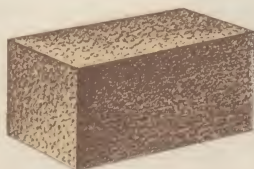


No. 104 ARCH ANGLE BUNG  
(11⅜" — 12¾") x 4½" x (3" — 2⅝")

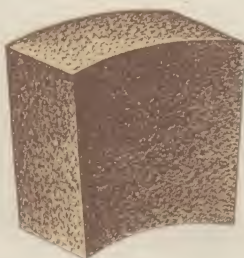


No. 105 ARCH BUNG  
13" x 4½" x (3" — 2⅝")

# FIRE CLAY MATERIAL



OPEN HEARTH CHECKER  
 $10\frac{1}{2}'' \times 4\frac{1}{2}'' \times 4\frac{1}{2}''$



9" ROTARY KILN BLOCKS  
 (9" — ) x 9" x 4"

No. of Block	Dimensions	Diameter		No. of Brick to Circle
		Ins.	Outs.	
9-48	9" x $6\frac{1}{2}''$ x 9" x 4"	48"	66"	23
9-54	9" x $6\frac{3}{4}''$ x 9" x 4"	54"	72"	25
9-60	9" x $6\frac{1}{2}''$ x 9" x 4"	60"	78"	27
9-66	9" x $7\frac{1}{8}''$ x 9" x 4"	66"	84"	29
9-72	9" x $7\frac{3}{8}''$ x 9" x 4"	72"	90"	31
9-78	9" x $7\frac{5}{8}''$ x 9" x 4"	78"	96"	33
9-84	9" x $7\frac{3}{4}''$ x 9" x 4"	84"	102"	36
9-90	9" x $7\frac{1}{2}''$ x 9" x 4"	90"	108"	38
9-96	9" x $7\frac{1}{4}''$ x 9" x 4"	96"	114"	40
9-102	9" x $7\frac{1}{8}''$ x 9" x 4"	102"	120"	42



## STANDARD SHAPES



6" CUPOLA AND ROTARY  
KILN BLOCKS

No. of Block	Dimensions	Diameter		No. of Brick to Circle
		Ins.	Outs.	
6-30	9" x 6 $\frac{7}{8}$ " x 6" x 4"	30"	42"	15
6-36	9" x 6 $\frac{3}{4}$ " x 6" x 4"	36"	48"	17
6-42	9" x 7" x 6" x 4"	42"	54"	19
6-48	9" x 7 $\frac{1}{8}$ " x 6" x 4"	48"	60"	21
6-54	9" x 7 $\frac{3}{8}$ " x 6" x 4"	54"	66"	23
6-60	9" x 7 $\frac{1}{2}$ " x 6" x 4"	60"	72"	25
6-66	9" x 7 $\frac{5}{8}$ " x 6" x 4"	66"	78"	27
6-72	9" x 7 $\frac{3}{4}$ " x 6" x 4"	72"	84"	29
6-78	9" x 7 $\frac{7}{8}$ " x 6" x 4"	78"	90"	31
6-84	9" x 7 $\frac{1}{2}$ " x 6" x 4"	84"	96"	33
6-90	9" x 7 $\frac{1}{8}$ " x 6" x 4"	90"	102"	36
6-96	9" x 8" x 6" x 4"	96"	108"	38
6-102	9" x 8 $\frac{1}{16}$ " x 6" x 4"	102"	114"	40
6-108	9" x 8 $\frac{3}{32}$ " x 6" x 4"	108"	120"	42



9" CUPOLA BLOCKS

No. of Block	Dimensions	Diameter		No. of Brick to Circle
		Ins.	Outs.	
A	9" x 5 $\frac{3}{4}$ " x 4 $\frac{1}{2}$ " x 9"	16"	25"	9
B	9" x 6 $\frac{1}{8}$ " x 4 $\frac{1}{2}$ " x 9"	21"	30"	11
C	9" x 6 $\frac{3}{4}$ " x 4 $\frac{1}{2}$ " x 9"	27"	36"	13
D	9" x 6 $\frac{1}{8}$ " x 4 $\frac{1}{2}$ " x 9"	30"	39"	14
E	9" x 7 $\frac{1}{4}$ " x 4 $\frac{1}{2}$ " x 9"	40"	49"	17
F	9" x 7 $\frac{3}{4}$ " x 4 $\frac{1}{2}$ " x 9"	51"	60"	21
G	9" x 7 $\frac{1}{8}$ " x 4 $\frac{1}{2}$ " x 9"	60"	69"	24
H	9" x 8" x 4 $\frac{1}{2}$ " x 9"	73"	82"	29



## *GENERAL INFORMATION ABOUT FIRE BRICK*

Moisture, especially in cold weather, will greatly injure any fire brick. Exposure to weather causes fire brick to rapidly deteriorate and the use of fire brick which have been thus exposed is the cause of many failures.

To obtain the best results from fire-brickwork, observe the following precautions :

Use good fire clay equal in refractoriness to the brick itself, mixing with water to thin paste. Dip brick and rub to make a brick-to-brick joint.

Warm slowly to expel moisture.

From 400 to 600 pounds of fire clay are enough to lay one thousand brick. Finely ground fire clay should be used for laying up fire clay brick.

For estimating on fire-brickwork, use the following figures :

1 square foot 4 ½-inch wall requires 7 nine-inch straight brick.

1 square foot 9-inch wall requires 14 brick.

1 square foot 13 ½-inch wall requires 21 brick.

1 cubic foot of fire-brickwork requires 17 brick.

1 cubic foot of fire-brickwork weighs 125 to 140 pounds.

1,000 brick (closely stacked) occupy 56 cubic feet.

1,000 brick (loosely stacked) occupy 72 cubic feet.

TABLE OF 9-INCH ARCH BRICK

Inside Diameter	Shapes Required				
	No. 3 Arch	No. 2 Arch	No. 1 Arch	Straight	Total
0 ft. 6 in.	19				19
1 " 0 "	12	15			27
1 " 6 "	4	30			34
1 " 9 "		38			38
2 " 0 "		34	8		42
2 " 6 "		26	23		49
3 " 0 "		19	38		57
3 " 6 "		11	53		64
4 " 0 "		4	68		72
4 " 3 "			76		76
4 " 6 "			76	4	80
5 " 0 "			76	11	87
5 " 6 "			76	19	95
6 " 0 "			76	27	103
6 " 6 "			76	34	110
7 " 0 "			76	42	118
7 " 6 "			76	49	125
8 " 0 "			76	57	133
8 " 6 "			76	64	140
9 " 0 "			76	72	148
9 " 6 "			76	79	155
10 " 0 "			76	87	163
10 " 6 "			76	94	170
11 " 0 "			76	102	178
11 " 6 "			76	109	185
12 " 0 "			76	117	193

TABLE OF 9-INCH WEDGE BRICK

Inside Diameter	Shapes Required			
	No. 2 Wedge	No. 1 Wedge	Straight	Total
2 ft. 3 in.	57			57
2 " 6 "	49	11		60
3 " 0 "	38	30		68
3 " 6 "	26	50		76
4 " 0 "	12	71		83
4 " 6 "		91		91
5 " 0 "		91	8	99
5 " 6 "		91	15	106
6 " 0 "		91	23	114
6 " 6 "		91	30	121
7 " 0 "		91	38	129
7 " 6 "		91	45	136
8 " 0 "		91	53	144
8 " 6 "		91	60	151
9 " 0 "		91	68	159
9 " 6 "		91	76	167
10 " 0 "		91	83	174
10 " 6 "		91	91	182
11 " 0 "		91	98	189
11 " 6 "		91	106	197
12 " 0 "		91	113	204
12 " 6 "		91	121	212

TABLE OF 9-INCH WEDGE BRICK

Inside Diameter	Shapes Required (Continued.)			
	No. 2 Wedge	No. 1 Wedge	Straight	Total
13 " 0 "		91	128	219
13 " 6 "		91	136	227
14 " 0 "		91	143	234
14 " 6 "		91	151	242
15 " 0 "		91	158	249
15 " 6 "		91	166	257
16 " 0 "		91	173	264
16 " 6 "		91	181	272
17 " 0 "		91	188	279
17 " 6 "		91	196	287
18 " 0 "		91	203	294
18 " 6 "		91	211	302
19 " 0 "		91	218	309
19 " 6 "		91	226	317
20 " 0 "		91	233	324
20 " 6 "		91	241	332
21 " 0 "		91	248	339
21 " 6 "		91	256	347
22 " 0 "		91	263	354
22 " 6 "		91	271	362
23 " 0 "		91	278	369
23 " 6 "		91	286	377
24 " 0 "		91	293	384
24 " 6 "		91	301	392
25 " 0 "		91	308	399
25 " 6 "		91	316	407
26 " 0 "		91	323	414
26 " 6 "		91	331	422
27 " 0 "		91	338	429
27 " 6 "		91	346	437

TABLE OF 9-INCH KEY BRICK

Inside Diameter	Shapes Required					
	No. 4 Key	No. 3 Key	No. 2 Key	No. 1 Key	Straight	Total
1 ft. 6 in.	25					25
2 " 0 "	16	13				29
2 " 6 "	9	25				34
3 " 0 "		38				38
3 ft. 6 in.		29	13			42
4 " 0 "		21	25			46
4 " 6 "		12	38			50
5 " 0 "		5	50			55
5 " 3 "			57			57
5 " 6 "			55	4		59
6 " 0 "			50	13		63
6 " 6 "			46	21		67
7 " 0 "			42	29		71
7 " 6 "			38	38		76
8 " 0 "			34	46		80
8 " 6 "			29	55		84
9 " 0 "			25	63		88
9 " 6 "			21	71		92

# TABLE OF 9-INCH KEY BRICK

Inside Diameter	Shapes Required (Continued.)					
	No 4 Key	No. 3 Key	No 2 Key	No. 1 Key	Straight	Total
10 " 0 "	.....	.....	17	80	.....	97
10 " 6 "	.....	.....	18	88	.....	101
11 " 0 "	.....	.....	9	96	.....	105
11 " 6 "	.....	.....	4	105	.....	109
12 " 0 "	.....	.....	.....	113	.....	113
12 " 6 "	.....	.....	.....	113	4	117
13 " 0 "	.....	.....	.....	113	9	122
13 " 6 "	.....	.....	.....	113	13	126
14 " 0 "	.....	.....	.....	113	17	130
14 " 6 "	.....	.....	.....	113	21	134
15 " 0 "	.....	.....	.....	113	25	138
15 " 6 "	.....	.....	.....	113	30	143
16 " 0 "	.....	.....	.....	113	34	147
16 " 6 "	.....	.....	.....	113	38	151
17 " 0 "	.....	.....	.....	113	42	155
17 " 6 "	.....	.....	.....	113	46	159
18 " 0 "	.....	.....	.....	113	50	163
18 " 6 "	.....	.....	.....	113	55	168
19 " 0 "	.....	.....	.....	113	59	172
19 " 6 "	.....	.....	.....	113	63	176
20 " 0 "	.....	.....	.....	113	67	180
20 " 6 "	.....	.....	.....	113	71	184
21 " 0 "	.....	.....	.....	113	76	189
21 " 6 "	.....	.....	.....	113	80	193
22 " 0 "	.....	.....	.....	113	84	197
22 " 6 "	.....	.....	.....	113	88	201
23 " 0 "	.....	.....	.....	113	92	205
23 " 6 "	.....	.....	.....	113	97	210
24 " 0 "	.....	.....	.....	113	101	214
24 " 6 "	.....	.....	.....	113	105	218
25 " 0 "	.....	.....	.....	113	109	222
25 " 6 "	.....	.....	.....	113	113	226
26 " 0 "	.....	.....	.....	113	117	230
26 " 6 "	.....	.....	.....	113	122	235
27 " 0 "	.....	.....	.....	113	126	239
27 " 6 "	.....	.....	.....	113	130	243
28 " 0 "	.....	.....	.....	113	134	247
28 " 6 "	.....	.....	.....	113	138	251
29 " 0 "	.....	.....	.....	113	143	256
29 " 6 "	.....	.....	.....	113	147	260
30 " 0 "	.....	.....	.....	113	151	264
30 " 6 "	.....	.....	.....	113	155	268
31 " 0 "	.....	.....	.....	113	159	272
31 " 6 "	.....	.....	.....	113	163	276
32 " 0 "	.....	.....	.....	113	168	281
32 " 6 "	.....	.....	.....	113	172	285
33 " 0 "	.....	.....	.....	113	176	289
33 " 6 "	.....	.....	.....	113	180	293
34 " 0 "	.....	.....	.....	113	184	297
34 " 6 "	.....	.....	.....	113	189	302
35 " 0 "	.....	.....	.....	113	193	306

TABLE OF 9X6X3-INCH KEY BRICK

Inside Diameter	Shapes Required			
	No. 2 Key 9x(6-4 $\frac{1}{3}$ )x3	No. 1 Key 9x(6-5 $\frac{3}{8}$ )x3	Squares	Total
6 ft. 0 in.	47	.....	.....	47
6 " 6 "	44	6	.....	50
7 " 0 "	42	12	.....	54
7 " 6 "	38	19	.....	57
8 " 0 "	34	26	.....	60
8 " 6 "	31	32	.....	63
9 " 0 "	27	39	.....	66
9 " 6 "	23	46	.....	69
10 " 0 "	20	52	.....	72
10 " 6 "	16	59	.....	75
11 " 0 "	18	66	.....	79
11 " 6 "	10	72	.....	82
12 " 0 "	6	79	.....	85
12 " 6 "	3	85	.....	88
13 " 0 "	.....	91	.....	91
13 " 6 "	.....	91	3	94
14 " 0 "	.....	91	6	97
14 " 6 "	.....	91	10	101
15 " 0 "	.....	91	13	104
15 " 6 "	.....	91	16	107
16 " 0 "	.....	91	19	110
16 ft. 6 in.	.....	91	22	113
17 " 0 "	.....	91	25	116
17 " 6 "	.....	91	28	119
18 " 0 "	.....	91	32	123
18 " 6 "	.....	91	35	126
19 " 0 "	.....	91	38	129
19 " 6 "	.....	91	41	132
20 " 0 "	.....	91	44	135
20 " 6 "	.....	91	47	138
21 " 0 "	.....	91	50	141
21 " 6 "	.....	91	54	145
22 " 0 "	.....	91	57	148
22 " 6 "	.....	91	60	151
23 " 0 "	.....	91	63	154
23 " 6 "	.....	91	66	157
24 " 0 "	.....	91	69	160
24 " 6 "	.....	91	72	163
25 " 0 "	.....	91	76	167
25 " 6 "	.....	91	79	170
26 " 0 "	.....	91	82	173
26 " 6 "	.....	91	85	176
27 " 0 "	.....	91	88	179
27 " 6 "	.....	91	91	182
28 " 0 "	.....	91	94	185
28 " 6 "	.....	91	98	189
29 " 0 "	.....	91	101	192
29 " 6 "	.....	91	104	195
30 " 0 "	.....	91	107	198

TABLE OF 13½ - INCH KEY BRICK

Inside Diameter	Shapes Required			
	No. 2 Key	No. 1 Key	Straight	Total
6 ft. 0 in.	52	.....	.....	52
6 " 6 "	48	7	.....	55
7 " 0 "	42	16	.....	58
7 " 6 "	37	24	.....	61
8 " 0 "	33	32	.....	65
8 " 6 "	28	40	.....	68
9 " 0 "	23	48	.....	71
9 " 6 "	18	56	.....	74
10 " 0 "	12	65	.....	77
10 " 6 "	7	73	.....	80
11 " 0 "	2	81	.....	83
11 " 3 "	.....	85	.....	85
11 " 6 "	.....	85	2	87
12 " 0 "	.....	85	5	90
12 " 6 "	.....	85	8	93
13 " 0 "	.....	85	11	96
13 " 6 "	.....	85	14	99
14 " 0 "	.....	85	17	102
14 " 6 "	.....	85	21	106
15 " 0 "	.....	85	24	109
15 " 6 "	.....	85	27	112
16 " 0 "	.....	85	30	115
16 " 6 "	.....	85	33	118
17 " 0 "	.....	85	36	121
17 " 6 "	.....	85	39	124
18 " 0 "	.....	85	43	128
18 " 6 "	.....	85	46	131
19 " 0 "	.....	85	49	134
19 " 6 "	.....	85	52	137
20 " 0 "	.....	85	55	140
20 " 6 "	.....	85	58	143
21 " 0 "	.....	85	61	146
21 " 6 "	.....	85	65	150
22 " 0 "	.....	85	68	153
22 " 6 "	.....	85	71	156
23 " 0 "	.....	85	74	159
23 " 6 "	.....	85	77	162
24 " 0 "	.....	85	80	165
24 " 6 "	.....	85	83	168
25 " 0 "	.....	85	87	172
25 " 6 "	.....	85	90	175
26 " 0 "	.....	85	93	178
26 " 6 "	.....	85	96	181
27 " 0 "	.....	85	99	184
27 " 6 "	.....	85	102	187
28 " 0 "	.....	85	105	190
28 " 6 "	.....	85	109	194
29 " 0 "	.....	85	112	197
29 " 6 "	.....	85	115	200
30 " 0 "	.....	85	118	203
30 " 6 "	.....	85	121	206
31 " 0 "	.....	85	124	209
31 " 6 "	.....	85	127	212
32 " 0 "	.....	85	131	216
32 " 6 "	.....	85	134	219

TABLE OF 13¼-INCH KEY BRICK

Inside Diameter	Shapes Required (Continued)			
	No. 2 Key	No. 1 Key	Straight	Total
33 " 0 "	.....	85	137	222
33 " 6 "	.....	85	140	225
34 " 0 "	.....	85	143	228
34 " 6 "	.....	85	146	231
35 " 0 "	.....	85	149	234

TABLE OF STANDARD 9" CIRCLE BRICK

Inside Diameter	Shapes Required					
	24-inch Circle	36-inch Circle	48-inch Circle	60-inch Circle	72-inch Circle	84-inch Circle
2 ft. 0 in.	12	.....	.....	.....	.....	.....
2 " 3 "	9	4	.....	.....	.....	.....
2 " 6 "	6	8	.....	.....	.....	.....
2 " 9 "	3	12	.....	.....	.....	.....
3 " 0 "	.....	16	.....	.....	.....	.....
3 " 3 "	.....	11	6	.....	.....	.....
3 " 6 "	.....	7	11	.....	.....	.....
3 " 9 "	.....	3	16	.....	.....	.....
4 " 0 "	.....	.....	20	.....	.....	.....
4 " 3 "	.....	.....	14	7	.....	.....
4 " 6 "	.....	.....	9	18	.....	.....
4 " 9 "	.....	.....	4	19	.....	.....
5 " 0 "	.....	.....	.....	24	.....	.....
5 " 3 "	.....	.....	.....	17	8	.....
5 " 6 "	.....	.....	.....	11	15	.....
5 " 9 "	.....	.....	.....	5	22	.....
6 " 0 "	.....	.....	.....	.....	28	.....
6 " 3 "	.....	.....	.....	.....	21	8
6 " 6 "	.....	.....	.....	.....	14	16
6 " 9 "	.....	.....	.....	.....	7	24
7 " 0 "	.....	.....	.....	.....	.....	32



TABLE OF 13½" WEDGE BRICK

Inside Diameter	Shapes Required				Total
	No. 3 Wedge 13½"x 6"x3" x2"	No. 2 Wedge 13½"x 6"x3" x2½"	No. 1 Wedge 13½"x 6"x3" x2¾"	Straight 13½"x6" x3"	
4 ft. 6 in.	85	.....	.....	.....	85
5 " 0 "	79	13	.....	.....	92
5 " 6 "	73	25	.....	.....	98
6 " 0 "	66	38	.....	.....	104
6 " 6 "	60	50	.....	.....	110
7 " 0 "	54	63	.....	.....	117
7 " 6 "	47	76	.....	.....	123
8 " 0 "	41	88	.....	.....	129
8 " 6 "	35	101	.....	.....	136
9 " 0 "	29	113	.....	.....	142
9 " 6 "	22	126	.....	.....	148
10 " 0 "	16	138	.....	.....	154
10 " 6 "	10	151	.....	.....	161
11 " 0 "	8	164	.....	.....	167
11 " 3 "	.....	170	.....	.....	170
11 " 6 "	.....	167	6	.....	173
12 " 0 "	.....	160	19	.....	179
12 " 6 "	.....	154	32	.....	186
13 " 0 "	.....	148	44	.....	192
13 " 6 "	.....	141	57	.....	198
14 " 0 "	.....	135	69	.....	204
14 " 6 "	.....	129	82	.....	211
15 " 0 "	.....	123	94	.....	217
15 " 6 "	.....	116	107	.....	223
16 " 0 "	.....	110	120	.....	230
16 " 6 "	.....	104	132	.....	236
17 " 0 "	.....	97	145	.....	242
17 " 6 "	.....	91	157	.....	248
18 " 0 "	.....	85	170	.....	255
18 " 6 "	.....	79	182	.....	261
19 " 0 "	.....	72	195	.....	267
19 " 6 "	.....	66	208	.....	274
20 " 0 "	.....	60	220	.....	280
20 " 6 "	.....	54	232	.....	286
21 " 0 "	.....	47	245	.....	292
21 " 6 "	.....	41	258	.....	299
22 " 0 "	.....	35	270	.....	305
22 " 6 "	.....	28	283	.....	311
23 " 0 "	.....	22	296	.....	317
23 " 6 "	.....	16	308	.....	324
24 " 0 "	.....	10	320	.....	330
24 " 6 "	.....	4	333	.....	337
24 " 9 "	.....	.....	340	.....	340
25 " 0 "	.....	.....	340	3	343
25 " 6 "	.....	.....	340	9	349

TABLE OF 13½" WEDGE BRICK

Inside Diameter	Shapes Required				Total
	No. 3 Wedge 13½"x 6"x3" x2"	No. 2 Wedge 13½"x 6"x3" x2½"	No. 1 Wedge 13½"x 6"x3" x2¾"	Straight 13½"x6" x3"	
26 " 0 "	.....	.....	340	15	355
26 " 6 "	.....	.....	340	22	362
27 " 0 "	.....	.....	340	28	368
27 " 6 "	.....	.....	340	35	375
28 " 0 "	.....	.....	340	41	381
28 " 6 "	.....	.....	340	47	387
29 " 0 "	.....	.....	340	53	393
29 " 6 "	.....	.....	340	60	400
30 " 0 "	.....	.....	340	66	406
30 " 6 "	.....	.....	340	72	412
31 " 0 "	.....	.....	340	79	419
31 " 6 "	.....	.....	340	85	425
32 " 0 "	.....	.....	340	91	431
32 " 6 "	.....	.....	340	97	437
33 " 0 "	.....	.....	340	104	444
33 " 6 "	.....	.....	340	110	450
34 " 0 "	.....	.....	340	116	456
34 " 6 "	.....	.....	340	122	462
35 " 0 "	.....	.....	340	129	469
35 " 6 "	.....	.....	340	135	475
36 " 0 "	.....	.....	340	141	481
36 " 6 "	.....	.....	340	147	487
37 " 0 "	.....	.....	340	154	494
37 " 6 "	.....	.....	340	160	500
38 " 0 "	.....	.....	340	167	507
38 " 6 "	.....	.....	340	173	513
39 " 0 "	.....	.....	340	179	519
39 " 6 "	.....	.....	340	185	525
40 " 0 "	.....	.....	340	192	532
40 " 6 "	.....	.....	340	198	538
41 " 0 "	.....	.....	340	204	544
41 " 6 "	.....	.....	340	211	551
42 " 0 "	.....	.....	340	217	557
42 " 6 "	.....	.....	340	223	563
43 " 0 "	.....	.....	340	229	569
43 " 6 "	.....	.....	340	236	576
44 " 0 "	.....	.....	340	242	582
44 " 6 "	.....	.....	340	248	588
45 " 0 "	.....	.....	340	255	595
45 " 6 "	.....	.....	340	261	601
46 " 0 "	.....	.....	340	267	607
46 " 6 "	.....	.....	340	273	613
47 " 0 "	.....	.....	340	280	620
47 " 6 "	.....	.....	340	286	626
48 " 0 "	.....	.....	340	292	632

# TABLE OF 6" CUPOLA BLOCKS

Inside Diameter Cupola Lining	Shapes Required							
	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.	66 in.	72 in.
2 ft. 6 in.	15							
2 " 9 "	8	8						
3 " 0 "		17						
3 " 3 "		9	9					
3 " 6 "			19					
3 " 9 "			9	11				
4 " 0 "				21				
4 " 3 "				10	12			
4 " 6 "					23			
4 " 9 "					12	12		
5 " 0 "						25		
5 " 3 "						13	13	
5 " 6 "							27	
5 " 9 "							15	13
6 " 0 "								29

Inside Diameter Cupola Lining	Shapes Required							
	66 in.	72 in.	78 in.	84 in.	90 in.	96 in.	102 in.	108 in.
6 ft. 3 in.		17	13					
6 " 6 "			31					
6 " 9 "			18	14				
7 " 0 "				33				
7 " 3 "				16	19			
7 " 6 "					36			
7 " 9 "					17	20		
8 " 0 "						38		
8 " 3 "						22	17	
8 " 6 "							40	
8 " 9 "							22	19
9 " 0 "								42

## 9" ROTARY KILN BLOCKS

Inside Diameter Lining	Shapes Required					
	48 in.	54 in.	60 in.	66 in.	72 in.	84 in.
4 ft. 0 in.	23					
4 " 3 "	12	12				
4 " 6 "		25				
4 " 9 "		13	13			
5 " 0 "			27			
5 " 3 "			15	13		
5 " 6 "				29		
5 " 9 "				17	13	
6 " 0 "					31	
6 " 3 "					18	14

Inside Diameter Lining	Shapes Required					
	72 in.	78 in.	84 in.	90 in.	96 in.	102 in.
6 ft. 0 in.		33				
6 " 9 "		16	19			
7 " 0 "			36			
7 " 3 "			17	20		
7 " 6 "				38		
7 " 9 "				22	17	
8 " 0 "					40	
8 " 3 "					22	19
8 " 6 "						42

## TABLE OF 9" CUPOLA BLOCKS

Inside Diameter Cupola Lining	Shapes Required							
	A	B	C	D	E	F	G	H
1 ft. 4 in.	9							
1 " 6 "	6	4						
1 " 9 "		11						
2 " 0 "		6	6					
2 " 3 "			13					
2 " 6 "				14				
3 " 0 "				6	10			
3 " 4 "					17			
3 " 6 "					14	4		
4 " 0 "					5	15		
4 " 3 "						21		
4 " 6 "						20	2	
5 " 0 "							24	
5 " 6 "							13	13
6 " 0 "							2	27
6 " 1 "								29

## TEMPERATURES

Below is given the fusion points of iron, steel and other metals, and some refractory oxides, according to the latest investigations:

(The figures given below, with exception of brass, cast iron, steel, wrought iron, are taken from a 1918 publication of the Bureau of Standards.)

(The figures for Kaolin, Alumina, and Magnesia are the work of Sosman, of the Geographical Laboratory, Washington.)

	Centigrade Degrees	Fahrenheit Degrees
Tin .....	231.9	449.4
Lead .....	327.4	621.3
Zinc.....	419.4	782.9
Antimony.....	630.0	986.0
Aluminum.....	658.7	1217.7
Silver .....	960.5	1760.9
Brass .....	1021	1870
Gold .....	1063.0	1945.5
Copper .....	1083.0	1981.4
Cast Iron, white .....	1135	2075
Cast Iron, gray.....	1222	2230
Steel .....	1300	2372
Iron, wrought.....	1500	2732
Nickel.....	1452	2646
Platinum .....	1755	3191
Silica.....	1750	3182
Kaolin.....	1755	3191
Alumina.....	2050	3722
Magnesia.....	2800	5072

## TEMPERATURES—CONTINUED

	Centigrade Degrees	Fahrenheit Degrees
Glass Furnace, between the pots.	1375	2507
In the pots, refining.....	1310	2390
In the pots, working.....	1045	1913
Tanks melted for casting.....	1310	2390
Annealing Glassware..... {	444	800
	to 555	to 1000
Siemens Crucible Steel {	1460	2660
Furnace varies from {	to 1590	to 2894
<b>BESSEMER PROCESS</b>		
Running the slag .....	1580	2876
Running steel into ladle.....	1640	2984
Running steel into mold.....	1580	2876
Soaking pit furnace, ingot in...	1200	2192
Ingot under hammer.....	1080	1976
<b>OPEN HEARTH PROCESS</b>		
Gas from producers .....	720	1328
Gas entering generator.....	400	752
Gas leaving generator.....	1200	2192
Air leaving generator.....	1000	1832
Fumes passing to shaft.....	300	572
End of fusion of charge.....	1420	2588
Refining the steel.....	1500	2732
Running into ladle, first.....	1580	2876
Running into ladle, last .....	1490	2714
<b>BLAST FURNACE—GREY BESSEMER</b>		
Front of tuyere.....	1930	3506
At tapping.....	1570	2858

The following table affords a somewhat rough method of estimating high temperatures.

	Centigrade Degrees	Fahrenheit Degrees
Just glowing in the dark.....	525	977
Dark red.....	700	1252
Cherry red.....	908	1666
Bright cherry red .....	1000	1832
Orange.....	1150	2102
White .....	1300	2372
Dazzling white.....	1500	2732



## FUSING POINTS OF SEGER CONES

Number of Cone	Fusing Point Original Scale		Number of Cone	Fusing Point Original Scale		Revised Scale*	
	Degrees Fahr.	Degrees Centig.		Degrees Fahr.	Degrees Centig.	Degrees Fahr.	Degrees Centig.
.022	1,094	590	10	2,426	1,330		
.021	1,148	620	11	2,462	1,350		
.020	1,202	650	12	2,498	1,370		
.019	1,256	680	13	2,534	1,390		
.018	1,310	710	14	2,570	1,410		
.017	1,364	740	15	2,606	1,430		
.016	1,418	770	16	2,642	1,450		
.015	1,472	800	17	2,678	1,470		
.014	1,526	830	18	2,714	1,490	2,714	1,490
.013	1,580	860	19	2,750	1,510	2,750	1,510
.012	1,634	890	20	2,786	1,530	2,786	1,530
.011	1,688	920	21†	2,822	1,550		
.010	1,742	950	22†	2,858	1,570		
.09	1,778	970	23†	2,894	1,590		
.08	1,814	990	24†	2,930	1,610		
.07	1,850	1,010	25†	2,966	1,630		
.06	1,886	1,030	26	3,002	1,650	2,912	1,600
.05	1,922	1,050	27	3,038	1,670	2,948	1,620
.04	1,958	1,070	28	3,074	1,690	2,975	1,635
.03	1,994	1,090	29	3,110	1,710	3,002	1,650
.02	2,030	1,110	30	3,146	1,730	3,038	1,670
.01	2,066	1,130	31	3,182	1,750	3,065	1,685
1	2,102	1,150	32	3,218	1,770	3,101	1,705
2	2,138	1,170	33	3,254	1,790	3,128	1,720
3	2,174	1,190	34	3,290	1,810	3,164	1,740
4	2,210	1,210	35	3,326	1,830	3,191	1,755
5	2,246	1,230	36	3,362	1,850		
6	2,282	1,250	37	3,398	1,870		
7	2,318	1,270	38	3,434	1,890		
8	2,354	1,290	39	3,470	1,910		
9	2,390	1,310					

\*U. S. Bureau of Standards, Washington, D. C.

†Cones 21 to 25 inclusive, all come down at practically the same temperature.



## COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETERS

Centi- grade	Fahren- heit	Centi- grade	Fahren- heit	Centi- grade	Fahren- heit
1815	3299	1770	3218	1725	3137
1814	3297.2	1769	3216.2	1724	3135.2
1813	3295.4	1768	3214.4	1723	3133.4
1812	3293.6	1767	3112.6	1722	3131.6
1811	3291.8	1766	3210.8	1721	3129.8
1810	3290	1765	3209	1720	3128
1809	3288.2	1764	3207.2	1719	3126.2
1808	3286.4	1763	3205.4	1718	3124.4
1807	3284.6	1762	3203.6	1717	3122.6
1806	3282.8	1761	3201.8	1716	3120.8
1805	3281	1760	3200	1715	3119
1804	3279.2	1759	3198.2	1714	3117.2
1803	3277.4	1758	3196.4	1713	3115.4
1802	3275.6	1757	3194.6	1712	3113.6
1801	3273.8	1756	3192.8	1711	3111.8
1800	3272	1755	3191	1710	3110
1799	3270.2	1754	3189.2	1709	3108.2
1798	3268.4	1753	3187.4	1708	3106.4
1797	3266.6	1752	3185.6	1707	3104.6
1796	3264.8	1751	3183.8	1706	3102.8
1795	3263	1750	3182	1705	3101
1794	3261.2	1749	3180.2	1704	3099.2
1793	3259.4	1748	3178.4	1703	3097.4
1792	3257.6	1747	3176.6	1702	3095.6
1791	3255.8	1746	3174.8	1701	3093.8
1790	3254	1745	3173	1700	3092
1789	3252.2	1744	3171.2	1699	3090.2
1788	3250.4	1743	3169.4	1698	3088.4
1787	3248.6	1742	3167.6	1697	3086.6
1786	3246.8	1741	3165.8	1696	3084.8
1785	3245	1740	3164	1695	3083
1784	3243.2	1739	3162.2	1694	3081.2
1783	3241.4	1738	3160.4	1693	3079.4
1782	3239.6	1737	3158.6	1692	3077.6
1781	3237.8	1736	3156.8	1691	3075.8
1780	3236	1735	3155	1690	3074
1779	3234.2	1734	3153.2	1689	3072.2
1778	3232.4	1733	3151.4	1688	3070.4
1777	3230.6	1732	3149.6	1687	3068.6
1776	3228.8	1731	3147.8	1686	3066.8
1775	3227	1730	3146	1685	3065
1774	3225.2	1729	3144.2	1684	3063.2
1773	3223.4	1728	3142.4	1683	3061.4
1772	3221.6	1727	3140.6	1682	3059.6
1771	3219.8	1726	3138.8	1681	3057.8

# COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETERS—CONTINUED

Centi- grade	Fahren- heit	Centi- grade	Fahren- heit	Centi- grade	Fahren- heit
1680	3056	1635	2975	1590	2894
1679	3054.2	1634	2973.2	1589	2892.2
1678	3052.4	1633	2971.4	1588	2890.4
1677	3050.6	1632	2969.6	1587	2888.6
1676	3048.8	1631	2967.8	1586	2886.8
1675	3047	1630	2966	1585	2885
1674	3045.2	1629	2964.2	1584	2883.2
1673	3043.4	1628	2962.4	1583	2881.4
1672	3041.6	1627	2960.6	1582	2879.6
1671	3039.8	1626	2958.8	1581	2877.8
1670	3038	1625	2957	1580	2876
1669	3036.2	1624	2955.2	1579	2874.2
1668	3034.4	1623	2953.4	1578	2872.4
1667	3032.6	1622	2951.6	1577	2870.6
1666	3030.8	1621	2949.8	1576	2868.8
1665	3029	1620	2948	1575	2867
1664	3027.2	1619	2946.2	1574	2865.2
1663	3025.4	1618	2944.4	1573	2863.4
1662	3023.6	1617	2942.6	1572	2861.6
1661	3021.8	1616	2940.8	1571	2859.8
1660	3020	1615	2939	1570	2858
1659	3018.2	1614	2937.2	1569	2856.2
1658	3016.4	1613	2935.4	1568	2854.4
1657	3014.6	1612	2933.6	1567	2852.6
1656	3012.8	1611	2931.8	1566	2850.8
1655	3011	1610	2930	1565	2849
1654	3009.2	1609	2928.2	1564	2847.2
1653	3007.4	1608	2926.4	1563	2845.4
1652	3005.6	1607	2924.6	1562	2843.6
1651	3003.8	1606	2922.8	1561	2841.8
1650	3002	1605	2921	1560	2840
1649	3000.2	1604	2919.2	1559	2838.2
1648	2998.4	1603	2917.4	1558	2836.4
1647	2996.6	1602	2915.6	1557	2834.6
1646	2994.8	1601	2913.8	1556	2832.8
1645	2993	1600	2912	1555	2831
1644	2991.2	1599	2910.2	1554	2829.2
1643	2989.4	1598	2908.4	1553	2827.4
1642	2987.6	1597	2906.6	1552	2825.6
1641	2985.8	1596	2904.8	1551	2823.8
1640	2984	1595	2903	1550	2822
1639	2982.2	1594	2901.2	1549	2820.2
1638	2980.4	1593	2899.4	1548	2818.4
1637	2978.6	1592	2897.6	1547	2816.6
1636	2976.8	1591	2895.8	1546	2814.8

# COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETERS—CONTINUED

Centi- grade	Fahren- heit	Centi- grade	Fahren- heit	Centi- grade	Fahren- heit
1545	2813	1500	2732	1455	2651
1544	2811.2	1499	2730.2	1454	2649.2
1543	2809.4	1498	2728.4	1453	2647.4
1542	2807.6	1497	2726.6	1452	2645.6
1541	2805.8	1496	2724.8	1451	2643.8
1540	2804	1495	2723	1450	2642
1539	2802.2	1494	2721.2	1449	2640.2
1538	2800.4	1493	2719.4	1448	2638.4
1537	2798.6	1492	2717.6	1447	2636.6
1536	2796.8	1491	2715.8	1446	2634.8
1535	2795	1490	2714	1445	2633
1534	2793.2	1489	2712.2	1444	2631.2
1533	2791.4	1488	2710.4	1443	2629.4
1532	2789.6	1487	2708.6	1442	2627.6
1531	2787.8	1486	2706.8	1441	2625.8
1530	2785	1485	2705	1440	2624
1529	2784.2	1484	2703.2	1439	2622.2
1528	2782.4	1483	2701.4	1438	2620.4
1527	2780.6	1482	2699.6	1437	2618.6
1526	2778.8	1481	2697.8	1436	2616.8
1525	2777	1480	2696	1435	2615
1524	2775.2	1479	2694.2	1434	2613.2
1523	2773.4	1478	2692.4	1433	2611.4
1522	2771.6	1477	2690.6	1432	2609.6
1521	2769.8	1476	2688.8	1431	2607.8
1520	2768	1475	2687	1430	2606
1519	2766.2	1474	2685.2	1429	2604.2
1518	2764.4	1473	2683.4	1428	2602.4
1517	2762.6	1472	2681.6	1427	2600.6
1516	2760.8	1471	2679.8	1426	2598.8
1515	2759	1470	2678	1425	2597
1514	2757.2	1469	2676.2	1424	2595.2
1513	2755.4	1468	2674.4	1423	2593.4
1512	2753.6	1467	2672.6	1422	2591.6
1511	2751.8	1466	2670.8	1421	2589.8
1510	2750	1465	2669	1420	2588
1509	2748.2	1464	2667.2	1419	2586.2
1508	2746.4	1463	2665.4	1418	2584.4
1507	2744.6	1462	2663.6	1417	2582.6
1506	2742.8	1461	2661.8	1416	2580.8
1505	2741	1460	2660	1415	2579
1504	2739.2	1459	2658.2	1414	2577.2
1503	2737.4	1458	2656.4	1413	2575.4
1502	2735.6	1457	2654.6	1412	2573.6
1501	2733.8	1456	2652.8	1411	2571.8

# COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETERS—CONTINUED

Centi- grade	Fahren- heit	Centi- grade	Fahren- heit	Centi- grade	Fahren- heit
1410	2570	1320	2408	870	1598
1409	2568.2	1310	2390	860	1580
1408	2566.4	1300	2372	850	1562
1407	2564.6	1290	2354	840	1544
1406	2562.8	1280	2336	830	1526
1405	2561	1270	2318	820	1508
1404	2559.2	1260	2300	810	1490
1403	2557.4	1250	2282	800	1472
1402	2555.6	1240	2264	790	1454
1401	2553.8	1230	2246	780	1436
1400	2552	1220	2228	770	1418
1399	2550.2	1210	2210	760	1400
1398	2548.4	1200	2192	750	1382
1397	2546.6	1190	2174	740	1364
1396	2544.8	1180	2156	730	1346
1395	2543	1170	2138	720	1328
1394	2541.2	1160	2120	710	1310
1393	2539.4	1150	2102	700	1292
1392	2537.6	1140	2084	690	1274
1391	2535.8	1130	2066	680	1256
1390	2534	1120	2048	670	1238
1389	2532.2	1110	2030	660	1220
1388	2530.4	1100	2012	650	1202
1387	2528.6	1090	1994	640	1184
1386	2526.8	1080	1976	630	1166
1385	2525	1070	1958	620	1148
1384	2523.2	1060	1940	610	1130
1383	2521.4	1050	1922	600	1112
1382	2519.6	1040	1904	590	1094
1381	2517.8	1030	1886	580	1076
1380	2516	1020	1868	570	1058
1379	2514.2	1010	1850	560	1040
1378	2512.4	1000	1832	550	1022
1377	2510.6	990	1814	540	1004
1376	2508.8	980	1796	530	986
1375	2507	970	1778	520	968
1374	2505.2	960	1760	510	950
1373	2503.4	950	1742	500	932
1372	2501.6	940	1724	490	914
1371	2499.8	930	1706	480	896
1370	2498	920	1688	470	878
1360	2480	910	1670	460	860
1350	2462	900	1652	450	842
1340	2444	890	1634	440	824
1330	2426	880	1616	430	806

# COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETERS—CONTINUED

Centi- grade	Fahren- heit	Centi- grade	Fahren- heit	Centi- grade	Fahren- heit
420	788	220	428	20	68
410	770	210	410	10	50
400	752	200	392	0	32
390	734	190	374	- 1	30.2
380	716	180	356	- 2	28.4
370	698	170	338	- 3	26.6
360	680	160	320	- 4	24.8
350	662	150	302	- 5	23
340	644	140	284	- 6	21.2
330	626	130	266	- 7	19.4
320	608	120	248	- 8	17.6
310	590	110	230	- 9	15.8
300	572	100	212	- 10	14
290	554	90	194	- 11	12.2
280	536	80	176	- 12	10.4
270	518	70	158	- 13	8.6
260	500	60	140	- 14	6.8
250	482	50	122	- 15	5
240	464	40	104	- 16	3.2
230	446	30	86	- 17	1.4
				- 18	0.4

Zero in Centigrade is the freezing point of water.

To change degrees Centigrade to Fahrenheit, multiply by 9, divide by 5 and add 32.

To change degrees Fahrenheit to Centigrade, subtract 32, divide by 9 and multiply by 5.



# CIRCUMFERENCES AND AREAS OF CIRCLES FROM 1-64 TO 50

Diam.	Circum.	Area	Diam.	Circum.	Area
☆	.04909	.000192	4	12.5664	12.5664
☆	.09818	.000767	4½	12.9591	13.3641
☆	.19635	.003068	4¼	13.3518	14.1863
½	.3927	.012272	4¾	13.7445	15.033
☆	.589	.027612	4½	14.1372	15.9043
¼	.7854	.049087	4½	14.5299	16.8002
☆	.98175	.076699	4¾	14.9226	17.7206
¾	1.1781	.110447	4½	15.3153	18.6555
☆	1.37445	.15033			
½	1.5708	.19635	5	15.708	19.635
☆	1.76715	.248505	5½	16.1007	20.629
¾	1.9635	.306796	5¼	16.4934	21.6476
tt	2.15985	.371224	5¾	16.8861	22.6907
¾	2.3562	.441787	5½	17.2788	23.7583
tt	2.55255	.518487	5½	17.6715	24.8505
½	2.7489	.601322	5¾	18.0642	25.9673
tt	2.94525	.690292	5½	18.4569	27.1086
1	3.1416	.7854	6	18.8496	28.2744
1½	3.5343	.99402	6½	19.2423	29.4648
1¼	3.927	1.2272	6¼	19.635	30.6797
1¾	4.3197	1.4849	6¾	20.0277	31.9191
1½	4.7124	1.7671	6½	20.4204	33.1831
1¾	5.1051	2.0739	6¾	20.8131	34.4717
1¾	5.4978	2.4053	6¾	21.2058	35.7848
1¾	5.8905	2.7612	6¾	21.5985	37.1224
2	6.2832	3.1416	7	21.9912	38.4846
2½	6.6759	3.5466	7½	22.3839	39.8713
2¼	7.0686	3.9761	7¼	22.7766	41.2826
2¾	7.4613	4.4301	7¾	23.1693	42.7184
2½	7.854	4.9087	7½	23.562	44.1787
2¾	8.2467	5.4119	7½	23.9547	45.6636
2¾	8.6394	5.9396	7¾	24.3474	47.1731
2¾	9.0321	6.4918	7¾	24.7401	48.7071
3	9.4248	7.0686	8	25.1328	50.2656
3½	9.8175	7.6699	8½	25.5255	51.8487
3¼	10.2102	8.2958	8¼	25.9182	53.4563
3¾	10.6029	8.9462	8¾	26.3109	55.0884
3½	10.9956	9.6211	8½	26.7036	56.7451
3¾	11.3883	10.3206	8¾	27.0963	58.4264
3¾	11.781	11.0447	8¾	27.489	60.1322
3¾	12.1737	11.7933	8¾	27.8817	61.8625

# CIRCUMFERENCES AND AREAS OF CIRCLES CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
9	28.2744	63.6174	15	47.124	176.715
9 $\frac{1}{8}$	28.6671	65.3968	15 $\frac{1}{8}$	47.5167	179.673
9 $\frac{1}{4}$	29.0598	67.2008	15 $\frac{1}{4}$	47.9094	182.655
9 $\frac{3}{8}$	29.4525	69.0293	15 $\frac{3}{8}$	48.3021	185.661
9 $\frac{1}{2}$	29.8452	70.8823	15 $\frac{1}{2}$	48.6948	188.692
9 $\frac{5}{8}$	30.2379	72.7599	15 $\frac{5}{8}$	49.0875	191.748
9 $\frac{3}{4}$	30.6306	74.6621	15 $\frac{3}{4}$	49.4802	194.828
9 $\frac{7}{8}$	31.0233	76.5888	15 $\frac{7}{8}$	49.8729	197.932
10	31.416	78.54	16	50.2656	201.062
10 $\frac{1}{8}$	31.8087	80.5158	16 $\frac{1}{8}$	50.6583	204.216
10 $\frac{1}{4}$	32.2014	82.5161	16 $\frac{1}{4}$	51.051	207.395
10 $\frac{3}{8}$	32.5941	84.5409	16 $\frac{3}{8}$	51.4437	210.598
10 $\frac{1}{2}$	32.9868	86.5903	16 $\frac{1}{2}$	51.8364	213.825
10 $\frac{5}{8}$	33.3795	88.6643	16 $\frac{5}{8}$	52.2291	217.077
10 $\frac{3}{4}$	33.7722	90.7628	16 $\frac{3}{4}$	52.6218	220.354
10 $\frac{7}{8}$	34.1649	92.8858	16 $\frac{7}{8}$	53.0145	223.655
11	34.5576	95.0334	17	53.4072	226.981
11 $\frac{1}{8}$	34.9503	97.2055	17 $\frac{1}{8}$	53.7999	230.331
11 $\frac{1}{4}$	35.343	99.4022	17 $\frac{1}{4}$	54.1926	233.906
11 $\frac{3}{8}$	35.7357	101.6234	17 $\frac{3}{8}$	54.5853	237.105
11 $\frac{1}{2}$	36.1284	103.8691	17 $\frac{1}{2}$	54.978	240.529
11 $\frac{5}{8}$	36.5211	106.1394	17 $\frac{5}{8}$	55.3707	243.977
11 $\frac{3}{4}$	36.9138	108.4343	17 $\frac{3}{4}$	55.7634	247.45
11 $\frac{7}{8}$	37.3065	110.7537	17 $\frac{7}{8}$	56.1561	250.948
12	37.6992	113.098	18	56.5488	254.47
12 $\frac{1}{8}$	38.0919	115.466	18 $\frac{1}{8}$	56.9415	258.016
12 $\frac{1}{4}$	38.4846	117.859	18 $\frac{1}{4}$	57.3342	261.587
12 $\frac{3}{8}$	38.8773	120.277	18 $\frac{3}{8}$	57.7269	265.183
12 $\frac{1}{2}$	39.27	122.719	18 $\frac{1}{2}$	58.1196	268.803
12 $\frac{5}{8}$	39.6627	125.185	18 $\frac{5}{8}$	58.5123	272.448
12 $\frac{3}{4}$	40.0554	127.677	18 $\frac{3}{4}$	58.905	276.117
12 $\frac{7}{8}$	40.4481	130.192	18 $\frac{7}{8}$	59.2977	279.811
13	40.8408	132.733	19	59.6904	283.529
13 $\frac{1}{8}$	41.2335	135.297	19 $\frac{1}{8}$	60.0831	287.272
13 $\frac{1}{4}$	41.6262	137.887	19 $\frac{1}{4}$	60.4756	291.04
13 $\frac{3}{8}$	42.0189	140.501	19 $\frac{3}{8}$	60.8685	294.832
13 $\frac{1}{2}$	42.4116	143.139	19 $\frac{1}{2}$	61.2612	298.648
13 $\frac{5}{8}$	42.8043	145.802	19 $\frac{5}{8}$	61.6540	302.489
13 $\frac{3}{4}$	43.197	148.49	19 $\frac{3}{4}$	62.0467	306.356
13 $\frac{7}{8}$	43.5897	151.202	19 $\frac{7}{8}$	62.4395	310.245
14	43.9824	153.938	20	62.832	314.16
14 $\frac{1}{8}$	44.3751	156.7	20 $\frac{1}{8}$	63.2247	318.099
14 $\frac{1}{4}$	44.7678	159.485	20 $\frac{1}{4}$	63.6174	322.063
14 $\frac{3}{8}$	45.1605	162.296	20 $\frac{3}{8}$	64.0101	326.051
14 $\frac{1}{2}$	45.5532	165.13	20 $\frac{1}{2}$	64.4028	330.064
14 $\frac{5}{8}$	45.9459	167.99	20 $\frac{5}{8}$	64.7955	334.102
14 $\frac{3}{4}$	46.3386	170.874	20 $\frac{3}{4}$	65.1882	338.164
14 $\frac{7}{8}$	46.7313	173.782	20 $\frac{7}{8}$	65.5809	342.25



# CIRCUMFERENCES AND AREAS OF CIRCLES CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
21	65.9736	346.361	27	84.8232	572.557
21 $\frac{1}{8}$	66.3663	350.497	27 $\frac{1}{8}$	85.2159	577.87
21 $\frac{1}{4}$	66.759	354.657	27 $\frac{1}{4}$	85.6086	583.209
21 $\frac{3}{8}$	67.1517	358.842	27 $\frac{3}{8}$	86.0013	588.571
21 $\frac{1}{2}$	67.5444	363.051	27 $\frac{1}{2}$	86.394	593.959
21 $\frac{5}{8}$	67.9379	367.285	27 $\frac{5}{8}$	86.7867	599.371
21 $\frac{3}{4}$	68.3298	371.543	27 $\frac{3}{4}$	87.1794	604.807
21 $\frac{7}{8}$	68.7225	375.826	27 $\frac{7}{8}$	87.5729	610.268
22	69.1152	380.134	28	87.9648	615.754
22 $\frac{1}{8}$	69.5079	384.466	28 $\frac{1}{8}$	88.3575	621.264
22 $\frac{1}{4}$	69.9006	388.822	28 $\frac{1}{4}$	88.7502	626.798
22 $\frac{3}{8}$	70.2933	393.203	28 $\frac{3}{8}$	89.1429	632.357
22 $\frac{1}{2}$	70.686	397.609	28 $\frac{1}{2}$	89.5356	637.941
22 $\frac{5}{8}$	71.0787	402.038	28 $\frac{5}{8}$	89.9283	643.549
22 $\frac{3}{4}$	71.4714	406.494	28 $\frac{3}{4}$	90.321	649.182
22 $\frac{7}{8}$	71.8641	410.973	28 $\frac{7}{8}$	90.7137	654.84
23	72.2568	415.477	29	91.1064	660.521
23 $\frac{1}{8}$	72.6495	420.004	29 $\frac{1}{8}$	91.4991	666.228
23 $\frac{1}{4}$	73.0422	424.558	29 $\frac{1}{4}$	91.8918	671.959
23 $\frac{3}{8}$	73.4349	429.135	29 $\frac{3}{8}$	92.2845	677.714
23 $\frac{1}{2}$	73.8276	433.737	29 $\frac{1}{2}$	92.6772	683.494
23 $\frac{5}{8}$	74.2203	438.364	29 $\frac{5}{8}$	93.0699	689.299
23 $\frac{3}{4}$	74.613	443.015	29 $\frac{3}{4}$	93.4626	695.128
23 $\frac{7}{8}$	75.0057	447.69	29 $\frac{7}{8}$	93.8553	700.982
24	75.3984	452.39	30	94.248	706.86
24 $\frac{1}{8}$	75.7911	457.115	30 $\frac{1}{8}$	94.6407	712.763
24 $\frac{1}{4}$	76.1838	461.864	30 $\frac{1}{4}$	95.0334	718.69
24 $\frac{3}{8}$	76.5765	466.638	30 $\frac{3}{8}$	95.4261	724.642
24 $\frac{1}{2}$	76.9692	471.436	30 $\frac{1}{2}$	95.8188	730.618
24 $\frac{5}{8}$	77.3619	476.259	30 $\frac{5}{8}$	96.2115	736.619
24 $\frac{3}{4}$	77.7546	481.107	30 $\frac{3}{4}$	96.6042	742.645
24 $\frac{7}{8}$	78.1473	485.979	30 $\frac{7}{8}$	96.9969	748.695
25	78.54	490.875	31	97.3896	754.769
25 $\frac{1}{8}$	78.9327	495.796	31 $\frac{1}{8}$	97.7823	760.869
25 $\frac{1}{4}$	79.3254	500.742	31 $\frac{1}{4}$	98.175	766.992
25 $\frac{3}{8}$	79.7181	505.712	31 $\frac{3}{8}$	98.5677	773.14
25 $\frac{1}{2}$	80.1108	510.706	31 $\frac{1}{2}$	98.9604	779.313
25 $\frac{5}{8}$	80.5035	515.726	31 $\frac{5}{8}$	99.3531	785.51
25 $\frac{3}{4}$	80.8962	520.769	31 $\frac{3}{4}$	99.7458	791.732
25 $\frac{7}{8}$	81.2889	525.838	31 $\frac{7}{8}$	100.1385	797.979
26	81.6816	530.93	32	100.5312	804.25
26 $\frac{1}{8}$	82.0743	536.048	32 $\frac{1}{8}$	100.9239	810.545
26 $\frac{1}{4}$	82.467	541.19	32 $\frac{1}{4}$	101.3166	816.865
26 $\frac{3}{8}$	82.8597	546.356	32 $\frac{3}{8}$	101.7093	823.21
26 $\frac{1}{2}$	83.2524	551.547	32 $\frac{1}{2}$	102.102	829.579
26 $\frac{5}{8}$	83.6451	556.763	32 $\frac{5}{8}$	102.4947	835.972
26 $\frac{3}{4}$	84.0378	562.003	32 $\frac{3}{4}$	102.8874	842.391
26 $\frac{7}{8}$	84.4305	567.267	32 $\frac{7}{8}$	103.2801	848.833

# CIRCUMFERENCES AND AREAS OF CIRCLES CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
33	103.673	855.301	39	122.522	1194.593
33 $\frac{1}{8}$	104.065	861.792	39 $\frac{1}{8}$	122.915	1202.263
33 $\frac{1}{4}$	104.458	868.309	39 $\frac{1}{4}$	123.308	1209.958
33 $\frac{3}{8}$	104.851	874.85	39 $\frac{3}{8}$	123.7	1217.677
33 $\frac{1}{2}$	105.344	881.415	39 $\frac{1}{2}$	124.093	1225.42
33 $\frac{5}{8}$	105.636	888.005	39 $\frac{5}{8}$	124.486	1233.188
33 $\frac{3}{4}$	106.029	894.62	39 $\frac{3}{4}$	124.879	1240.981
33 $\frac{7}{8}$	106.422	901.259	39 $\frac{7}{8}$	125.271	1248.798
34	106.814	907.922	40	125.664	1256.64
34 $\frac{1}{8}$	107.207	914.611	40 $\frac{1}{8}$	126.057	1264.51
34 $\frac{1}{4}$	107.6	921.323	40 $\frac{1}{4}$	126.449	1272.4
34 $\frac{3}{8}$	107.992	928.061	40 $\frac{3}{8}$	126.842	1280.31
34 $\frac{1}{2}$	108.385	934.822	40 $\frac{1}{2}$	127.235	1288.25
34 $\frac{5}{8}$	108.778	941.609	40 $\frac{5}{8}$	127.627	1296.22
34 $\frac{3}{4}$	109.171	948.42	40 $\frac{3}{4}$	128.02	1304.21
34 $\frac{7}{8}$	109.563	955.255	40 $\frac{7}{8}$	128.413	1312.22
35	109.956	962.115	41	128.806	1320.26
35 $\frac{1}{8}$	110.349	969.	41 $\frac{1}{8}$	129.198	1328.32
35 $\frac{1}{4}$	110.741	975.909	41 $\frac{1}{4}$	129.591	1336.41
35 $\frac{3}{8}$	111.134	982.842	41 $\frac{3}{8}$	129.984	1344.52
35 $\frac{1}{2}$	111.527	989.8	41 $\frac{1}{2}$	130.376	1352.66
35 $\frac{5}{8}$	111.919	996.783	41 $\frac{5}{8}$	130.769	1360.82
35 $\frac{3}{4}$	112.312	1003.79	41 $\frac{3}{4}$	131.162	1369.
35 $\frac{7}{8}$	112.705	1010.822	41 $\frac{7}{8}$	131.554	1377.21
36	113.098	1017.878	42	131.947	1385.45
36 $\frac{1}{8}$	113.49	1024.96	42 $\frac{1}{8}$	132.34	1393.7
36 $\frac{1}{4}$	113.883	1032.065	42 $\frac{1}{4}$	132.733	1401.99
36 $\frac{3}{8}$	114.276	1039.195	42 $\frac{3}{8}$	133.125	1410.3
36 $\frac{1}{2}$	114.668	1046.349	42 $\frac{1}{2}$	133.518	1418.63
36 $\frac{5}{8}$	115.061	1053.528	42 $\frac{5}{8}$	133.911	1426.99
36 $\frac{3}{4}$	115.454	1060.732	42 $\frac{3}{4}$	134.303	1435.37
36 $\frac{7}{8}$	115.846	1067.96	42 $\frac{7}{8}$	134.696	1443.77
37	116.239	1075.213	43	135.089	1452.2
37 $\frac{1}{8}$	116.632	1082.49	43 $\frac{1}{8}$	135.481	1460.66
37 $\frac{1}{4}$	117.025	1089.792	43 $\frac{1}{4}$	135.874	1469.14
37 $\frac{3}{8}$	117.417	1097.118	43 $\frac{3}{8}$	136.267	1477.64
37 $\frac{1}{2}$	117.81	1104.460	43 $\frac{1}{2}$	136.66	1486.17
37 $\frac{5}{8}$	118.203	1111.844	43 $\frac{5}{8}$	137.052	1494.73
37 $\frac{3}{4}$	118.595	1119.244	43 $\frac{3}{4}$	137.445	1503.3
37 $\frac{7}{8}$	118.988	1126.669	43 $\frac{7}{8}$	137.838	1511.91
38	119.381	1134.118	44	138.23	1520.53
38 $\frac{1}{8}$	119.773	1141.591	44 $\frac{1}{8}$	138.623	1529.19
38 $\frac{1}{4}$	120.166	1149.089	44 $\frac{1}{4}$	139.016	1537.86
38 $\frac{3}{8}$	120.559	1156.612	44 $\frac{3}{8}$	139.408	1546.56
38 $\frac{1}{2}$	120.952	1164.159	44 $\frac{1}{2}$	139.801	1555.29
38 $\frac{5}{8}$	121.344	1171.731	44 $\frac{5}{8}$	140.194	1564.04
38 $\frac{3}{4}$	121.737	1179.327	44 $\frac{3}{4}$	140.587	1572.81
38 $\frac{7}{8}$	122.13	1186.948	44 $\frac{7}{8}$	140.979	1581.61

# CIRCUMFERENCES AND AREAS OF CIRCLES CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
45	141.372	1590.43	51	160.22	2042.82
45 $\frac{1}{8}$	141.765	1599.28	52	163.36	2123.71
45 $\frac{1}{4}$	142.157	1608.16	53	166.50	2206.18
45 $\frac{3}{8}$	142.55	1617.05	54	169.65	2290.21
45 $\frac{1}{2}$	142.943	1625.97	55	172.79	2375.82
45 $\frac{5}{8}$	143.335	1634.92	56	175.93	2463.01
45 $\frac{3}{4}$	143.728	1643.89	57	179.07	2551.75
45 $\frac{7}{8}$	144.121	1652.89	58	182.21	2642.08
			59	185.35	2733.97
			60	188.50	2827.43
46	144.514	1661.91	61	191.64	2922.46
46 $\frac{1}{8}$	144.906	1670.95	62	194.78	3019.07
46 $\frac{1}{4}$	145.299	1680.02	63	197.92	3117.24
46 $\frac{3}{8}$	145.692	1689.11	64	201.06	3216.99
46 $\frac{1}{2}$	146.084	1698.23	65	204.20	3318.30
46 $\frac{5}{8}$	146.477	1707.37	66	207.35	3421.18
46 $\frac{3}{4}$	146.87	1716.54	67	210.49	3525.65
46 $\frac{7}{8}$	147.262	1725.73	68	213.63	3631.68
			69	216.77	3739.28
			70	219.91	3848.45
47	147.655	1734.95	71	223.05	3959.19
47 $\frac{1}{8}$	148.048	1744.19	72	226.19	4071.50
47 $\frac{1}{4}$	148.441	1753.45	73	229.34	4185.38
47 $\frac{3}{8}$	148.833	1762.74	74	232.48	4300.84
47 $\frac{1}{2}$	149.226	1772.06	75	235.62	4417.86
47 $\frac{5}{8}$	149.619	1781.4	76	238.76	4536.45
47 $\frac{3}{4}$	150.011	1790.76	77	241.90	4656.62
47 $\frac{7}{8}$	150.404	1800.15	78	245.04	4778.36
			79	248.19	4901.66
			80	251.33	5026.54
48	150.797	1809.56	81	254.47	5153.00
48 $\frac{1}{8}$	151.189	1819.	82	257.61	5281.01
48 $\frac{1}{4}$	151.582	1828.46	83	260.75	5410.50
48 $\frac{3}{8}$	151.975	1837.95	84	263.89	5541.77
48 $\frac{1}{2}$	152.368	1847.46	85	267.04	5674.50
48 $\frac{5}{8}$	152.76	1856.99	86	270.18	5808.80
48 $\frac{3}{4}$	153.153	1866.55	87	273.32	5944.67
48 $\frac{7}{8}$	153.546	1876.14	88	276.46	6082.11
			89	279.60	6221.13
			90	282.74	6361.72
49	153.938	1885.75	91	285.88	6503.87
49 $\frac{1}{8}$	154.331	1895.38	92	289.03	6647.61
49 $\frac{1}{4}$	154.724	1905.04	93	292.17	6792.90
49 $\frac{3}{8}$	155.116	1914.72	94	295.31	6939.78
49 $\frac{1}{2}$	155.509	1924.43	95	298.45	7088.21
49 $\frac{5}{8}$	155.902	1934.16	96	301.59	7238.23
49 $\frac{3}{4}$	156.295	1943.91	97	304.73	7389.81
49 $\frac{7}{8}$	156.687	1953.69	98	307.88	7542.96
			99	311.02	7697.68
50	157.08	1963.5	100	314.16	7853.97

**TABLE FOR CIRCLE BRICK**  
*For Length of Chord Multiply Sine by Diameter*

No. to Circle	Sine of Half Angle	Diameter for 9" Chord	No. to Circle	Sine of Half Angle	Diameter for 9" Chord
5	.58779	15.311"	28	.11196	80.385"
6	.50000	18.000"	29	.10811	83.248"
7	.43386	20.740"	30	.10453	86.099"
8	.38268	23.518"	31	.10044	89.605"
9	.34202	26.314"	32	.09802	91.818"
10	.30902	29.124"	33	.09507	94.667"
11	.28173	31.945"	34	.09225	97.560"
12	.25882	34.773"	35	.08965	100.390"
13	.23932	37.606"	36	.08716	103.257"
14	.22251	40.447"	37	.08481	106.119"
15	.20791	43.287"	38	.08258	108.985"
16	.19509	46.132"	39	.08046	111.856"
17	.18428	48.833"	40	.07846	114.708"
18	.17365	51.828"	41	.07655	117.570"
19	.16459	54.681"	42	.07472	120.449"
20	.15643	57.533"	43	.07300	123.287"
21	.14904	60.386"	44	.07136	127.102"
22	.14230	63.246"	45	.06976	129.014"
23	.13617	66.094"	46	.06825	131.868"
24	.13053	68.949"	47	.06679	134.750"
25	.12534	71.805"	48	.06540	137.614"
26	.12054	74.664"	49	.06407	140.471"
27	.11609	77.526"	50	.06279	143.334"

## WEIGHTS OF VARIOUS MATERIALS

Material	Average Per Cu. Ft. Pounds
<b>BRICK</b>	
Common red .....	100
Fire clay .....	125 to 140
Silica .....	105
Chrome .....	175
Magnesia as brick or fused in furnace .....	170
<b>CEMENT</b>	
Portland .....	78
Hydraulic .....	60
<b>FINE GROUND CLAYS, SILICA CEMENT, ETC.</b>	
Fire clay .....	85
Silica cement .....	75
Magnesia cement .....	127
Chrome cement .....	135
Grain magnesite (as shipped) .....	112
<b>COAL AND COKE</b>	
Anthracite .....	60
Bituminous .....	49
Charcoal .....	18.5
Coke .....	26.3
<b>CONCRETE</b>	
Cement, fine .....	137
Rubble, coarse .....	119
<b>EARTH</b>	
Loam, dry, loose .....	76
Loam, packed .....	95
Loam, soft, loose mud .....	108
Loam, dense mud .....	125
<b>GLASS</b>	
Common window .....	157
Plate .....	172
Flint .....	192
Floor or skylight .....	158
<b>GRAIN</b>	
Corn .....	45
Oats .....	24
Wheat .....	48
<b>LIME</b>	
Quick, loose lumps .....	53
Quick, fine .....	75
Stone, large rocks .....	168
Stone, irregular lumps .....	96
<b>MASONRY</b>	
Granite or limestone .....	165
Mortar, rubble .....	154
Dry .....	138
Sandstone, dressed .....	144
<b>METALS</b>	
Aluminum .....	166
Brass, cast .....	524
Bronze .....	534
Copper, cast .....	537
Copper, rolled or wire .....	555
Iron, cast .....	450
Iron, wrought .....	482

## WEIGHTS OF VARIOUS MATERIALS CONTINUED

Material	Average Per Cu. Ft. Pounds
<b>METALS—Continued</b>	
Lead, cast.....	708
Lead, rolled.....	711
Steel, cast.....	490
Steel, rolled.....	495
Tin, cast.....	459
Zinc, cast.....	438
<b>OILS</b>	
Engine.....	55
Crude.....	48
Petroleum.....	55
Gasoline.....	43
<b>ROCK</b>	
Chalk.....	145
Granite.....	165
Gypsum.....	143
Sandstone.....	144
Pumice stone.....	57
Quartz.....	165
Salt, coarse.....	45
Salt, fine.....	49
Shales.....	162
Slate, American.....	175
<b>SAND</b>	
Dry and loose.....	100
Dry and packed.....	110
Wet and packed.....	130
Gravel packed.....	118
<b>WATER</b>	
Water as ice.....	58.7
Water at 32 degrees Fahrenheit.....	62.4
Water at 212 degrees Fahrenheit.....	59.6
<b>WOODS, DRY</b>	
Apple.....	48
Beech.....	43
Birch.....	45
Cedar, American.....	35
Chestnut.....	41
Ebony.....	76
Elm.....	35
Hemlock.....	25
Hickory.....	53
Ironwood.....	114
Mahogany.....	35 to 53
Maple.....	49
Oak, live.....	59
Oak, white.....	50
Pine, white.....	25
Pine, yellow northern.....	34
Pine, yellow southern.....	45
Spruce.....	25
Walnut.....	35



# *DECIMALS OF AN INCH FOR EACH 1-64TH*

1-64 . . .015625	33-64 . . .515625
1-32 . . .03125	17-32 . . .53125
3-64 . . .046875	35-64 . . .546875
1-16 . . .0625	9-16 . . .5625
5-64 . . .078125	37-64 . . .578125
3-32 . . .09375	19-32 . . .59375
7-64 . . .109375	39-64 . . .609375
1-8 . . .125	5-8 . . .625
9-64 . . .140625	41-64 . . .640625
5-32 . . .15625	21-32 . . .65625
11-64 . . .171875	43-64 . . .671875
3-16 . . .1875	11-16 . . .6875
13-64 . . .203125	45-64 . . .703125
7-32 . . .21875	23-32 . . .71875
15-64 . . .234375	47-64 . . .734375
1-4 . . .250	3-4 . . .75
17-64 . . .265625	49-64 . . .765625
9-32 . . .28125	25-32 . . .78125
19-64 . . .296875	51-64 . . .796875
5-16 . . .3125	13-16 . . .8125
21-64 . . .328125	53-64 . . .828125
11-32 . . .34375	27-32 . . .84375
23-64 . . .359375	55-64 . . .859375
3-8 . . .375	7-8 . . .875
25-64 . . .390625	57-64 . . .890625
13-32 . . .40625	29-32 . . .90625
27-64 . . .421875	59-64 . . .921875
7-16 . . .4375	15-16 . . .9375
29-64 . . .453125	61-64 . . .953125
15-32 . . .46875	31-32 . . .96875
31-64 . . .484375	63-64 . . .984375
1-2 . . .500	1 . . .1.



## METRIC WEIGHTS AND MEASURES

### METRIC WEIGHTS

Milligram (.001 gram)	- - - - -	0.0154	grain
Centigram (.01 gram)	- - - - -	0.1543	grain
Decigram (.1 gram)	- - - - -	1.5432	grains
Gram	- - - - -	15.4324	grains
Decagram (10 grams)	- - - - -	0.3527	oz. avoird.
Hectogram (100 grams)	- - - - -	3.5274	oz. avoird.
Kilogram (1000 grams)	- - - - -	2.2046	lbs. avoird.
Myriagram (10,000 grams)	- - - - -	22.02462	lbs. avoird.
Quintal (100 kilos)	- - - - -	220.4622	lbs. avoird.
Millier or Ton (1000 kilos)	- - - - -	2,204.6228	lbs. avoird.

### METRIC DRY MEASURES

Milliliter (.001 liter)	- - - - -	0.061	cu. in.
Centiliter (.01 liter)	- - - - -	0.6103	cu. in.
Deciliter (.1 liter)	- - - - -	6.1027	cu. in.
Liter	- - - - -	0.9081	quart
Decaliter (10 liters)	- - - - -	9.0808	quarts
Hectoliter (100 liters)	- - - - -	2.8377	bushels
Kiloliter (1000 liters)	- - - - -	1.3079	cu. yds.

### METRIC LIQUID MEASURES

Milliliter (.001 liter)	- - - - -	0.0338	fluid oz.
Centiliter (.01 liter)	- - - - -	0.3381	fluid oz.
Deciliter (.1 liter)	- - - - -	0.8452	gill
Liter	- - - - -	1.0567	quarts
Decaliter (10 liters)	- - - - -	2.6417	gallons
Hectoliter (100 liters)	- - - - -	26.4170	gallons
Kiloliter (1000 liters)	- - - - -	264.1705	gallons

*Metric Weights and Measures—Continued.*

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**METRIC MEASURES OF LENGTH**

Millimeter (.001 meter)	- - - - -	0.03937 inch
Centimeter (.01 meter)	- - - - -	0.3937 inch
Decimeter (.1 meter)	- - - - -	3.937 inches
Meter	- - - - -	39.37 inches
Decameter (10 meters)	- - - - -	32.8083 feet
Hectometer (100 meters)	- - - - -	328.083 feet
Kilometer (1000 meters)	- - - - -	3280.83 feet
Kilometer (1000 meters)	- - - - -	0.62137 mile
Myriameter (10,000 meters)	- - - - -	6.2137 miles

**METRIC SURFACE MEASURES**

Centare (1 sq. meter)	- - - - -	1,550 sq. in.
Are (100 sq. meters)	- - - - -	119.6 sq. yds.
Hectare (10,000 sq. meters)	- - -	2.471 acres



